United States Department of Agriculture
Forest Service
Southwestern Region
Forest Health
Arizona Zone Office
2500 S. Pine Knoll Drive
Flagstaff, AZ 86001-6381
FAX (928) 556-2130
Voice (928) 556-2073

File Code: 3420
Date: September 27, 2007

Area Director
USDI-Bureau of Indian Affairs□□Phoenix Area Office
P.O. Box 10
Phoenix, AZ 85001

Dear Area Director:

On September 6, 2007, Mary Lou Fairweather, Plant Pathologist with this office, visited the FY 2008 Malay Gap Dwarf Mistletoe Suppression Project proposed by Victoria Wesley, Supervisory Forester, San Carlos Forest Resource Program, San Carlos Apache Reservation. This letter describes dwarf mistletoe infestations, general stand conditions, and makes recommendations to minimize impacts caused by dwarf mistletoe infection.

Figure 1 Stands are dominated by ponderosa pine dispersed in groups varying in size.

Existing Conditions

Nine stands encompassing 756 acres are proposed for treatment. All stands are dominated by ponderosa pine, typically in groups of varying size classes, which are intermixed with gambel oak, southwestern white pine, Douglas fir, live oaks and juniper (Figure 1). A summary of stand exam survey data is presented in Table 1. This data was collected before the recent commercial timber harvest in which the most severely infected overstory trees were harvested from some stands. Volumes in square feet of basal area per acre (BA) range 59 to 225. Trees per acre (TPA) less than 7 inch in diameter at breast height (DBH) range from 800 to about 3007. Average stand dwarf mistletoe ratings (DMR) are low to moderate, ranging from 0.1 to 1.0.

Figure 2 Dwarf mistletoe infection in regeneration.

The primary objective of the FY08 Malay Gap project is to promote the growth of ponderosa pine while reducing the impacts of dwarf mistletoe infection. These treatments are approved under the San Carlos Apache Tribe's Management Plan, which allow areas to be sanitized by removing all visible dwarf mistletoe infection and provide improved growing conditions for healthy,

uninfected trees. The proposed action is to cut all seedlings, saplings and pole sized trees <7" DBH with visible dwarf mistletoe infection greater than DMR 2. The targeted basal area is 40-50 BA. Slash will be lopped and scattered or hand/machine piled and burned to reduce fire hazard and decrease ips beetle brood success.

Table 1. Stand exam data summary table for sites proposed for dwarf mistletoe suppression treatment.

Stand Number	Acres	BA	Trees per acre <7 inch DBH	DMR
Skyline Proj.				
35	91	114	2012	1.0
36	178	120	2000	0.5
58	65	225	3007	0.1
66	108	197	1471	1.0
Steven's Trail Proj.				
69	98	59	893	0.1
70	71	134	1007	0.8
71	25	80	800	0.1
72	86	90	850	0.3
73	34	64	1063	0.9
Totals	756			

Treatment Options

The typical focus of managing mistletoe is to reduce the impacts of mistletoe infection on forested sites. Mistletoe management is a continuous process. New dwarf mistletoe infections take 3- to 5-years (latent period) before producing aerial shoots, so not all infection can be detected and removed during one treatment. At least one treatment will be needed 5 to 10 years after an initial treatment and can be accomplished during regularly scheduled silvicultural or prescribed fire treatments.

Several features of dwarf mistletoes make them ideal candidates for cultural management[i]:

- Dwarf mistletoes require a living host to survive. Mistletoe dies when an infected tree or branch is cut.

- Dwarf mistletoes are commonly restricted to a single host species or a group of closely related species. Non-host species can be favored during stand treatments.

- Dwarf mistletoes have fairly long life cycles and slow spread rates.

- Spread rates average only 1 foot per year. Although birds contribute to long-distance dispersal of seeds, this is rare and of little practical significance from a control perspective.

- Southwestern dwarf mistletoe-infected ponderosa pine trees are generally easy to detect due to the presence of yellow-orange shoots and witches' brooms. Trees in heavily infected stands show signs of short stature, decline, and mortality.

Managing dwarf mistletoe is difficult in stands under uneven-age management because younger trees become heavily diseased from seeds showering down from infected overstory trees. Initially, all infections in the young stand develop directly from seeds produced from overstory trees. Then there is a transition period when infections in the young stand begin to produce seeds that further infect the stand. Subsequently, infection in the young stand progresses outward beyond the range of the seeds produced in the overstory stand. Researchers[ii] [iii] have found nearly all infection in 20 year old stands was found to be attributable to seed produced in the overstory with 80 percent of infected seedlings found within 35 feet of infected overstory trees. In 50-year-old trees, lateral spread accounted for about one-half of the spread in open stands and one-third of the total in dense stands, with distances from the original overstory seed source reaching nearly 80 feet and 65 feet, respectively.

If uneven-aged treatments are to be applied in dwarf mistletoe infected stands, the sites should have very low levels of mistletoe and the mistletoe dispersed in defined patches. Group selection could be used to effectively remove infected trees and limit spread.

Prescribed burns can also be used to reduce dwarf mistletoe infection levels. Heavily infected trees have been shown to have reduced post-burn survival rates compared to lightly infected or non-infected trees[iv] [v]. Limbs located in the lower crowns of trees are killed during fire. Since dwarf mistletoe infections are generally more abundant in the lower crowns of infected trees, infection levels are decreased by the death of lower limbs.

Recommendations

After field checking present stand conditions and reviewing the proposed silvicultural prescription, we believe the management schemes presented here are biologically sound methods of reducing the impacts of dwarf mistletoe infection. Based on stocking levels, infection levels, and stand composition, sanitation treatments appear to be an effective means of growing healthy trees on these sites. The reduced infection levels and decreased densities should lessen the impact of disease on residual trees. Latent infections are expected to be visible in about 5 years and will be managed in subsequent cutting cycles.

Treatments to mitigate mistletoe impacts should be integrated with other treatment activities such as reducing stand susceptibility to fire or insect outbreaks. Uneven-aged treatments should only be considered in non-dwarf mistletoe infested or lightly infested stands that have well defined infection patches in which group selection can be used to target the removal of infected trees. Even-aged treatments are recommended in moderately to heavily dwarf mistletoe infected stands. Moderately infected stands that are adequately stocked can be thinned by targeting the

more severely infected trees while also emphasizing the most vigorously growing trees. Increasing space between trees helps limit spread because seeds of dwarf mistletoe are explosively released and typically travel 10 to 40 feet from a fruit bearing plant. This reduces infection levels while still allowing trees to grow to maturity. Regardless of the emphasis on even-aged or uneven-aged stands, monitoring for follow-up treatments in 5 to 10 years is recommended.

In addition to concurring with the proposed prescriptions, our office recommends that slash be generated between late summer and the end of December, if possible, in order to lessen the buildup of ips bark beetles. Slash piles should be placed in stand openings as much as possible and the largest diameter slash put on the outside of the pile to promote quick drying. Tepee style slash piles are made with branches and small-diameter slash in the middle and the larger diameter material on the outside.

If you have any questions regarding this evaluation, please call Mary Lou Fairweather at (928) 556-2075.

Sincerely,

/s/ John Anhold
JOHN ANHOLD
Arizona Zone Leader Forest Health

cc: Alicia DiValentino, Victoria Wesley, Debra Allen-Reid

---

[i] Johnson, David W.; Hawksworth, Frank G. 1985. Candidates for control through cultural management. In: Loomis, Robert C; Tucker, Susan; Hofacker, Thomas H. Insect and disease conditions in the United States, 1979-83: What else is growing in our forests? Gen. Tech. Rep. WO-46. Washington, DC: U.S. Department of Agriculture, Forest Service, State and Private Forestry, Forest Pest Management: 48-55.

[ii] Gill, L.S. and F.G. Hawksworth. 1954. Dwarf mistletoe control in southwestern ponderosa pine forests under management. Jour. Forestry 52: 347-353.

[iii] Hawksworth, F.G. 1961. Dwarf mistletoe of ponderosa pine in the Southwest. Tech. Bull. 1246. USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station. 13p.

[iv] Alexander, M.E. and F.G. Hawksworth. 1976. Fire and dwarf mistletoes in North American coniferous forests. Jour. Forestry. 74 (7): 446-449.

[v] Conklin, D.A. and W.A. Armstrong. 2001. Effects of three prescribed fires on dwarf mistletoe infection in southwestern ponderosa pine. USDA Forest Service, Southwestern Region, Forestry and Forest Health. R3-01-02. 17 p.